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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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WELLS ST. JOHN ROBERTS GREGORY & MATKIN P.S.
601 W. FIRST AVENUE
SUITE 1300
SPOKANE, WA 99201-3828

EXAMINER
FULLER, ERIC B

ART UNIT	PAPER NUMBER
1762	

DATE MAILED: 01/29/2003

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/905,286	BASCERI ET AL.	
	Examiner	Art Unit	
	Eric B Fuller	1762	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 November 2002* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-22 and 24-31* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-22 and 24-31* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *18* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1 - 4, 6 – 9, 11 – 22, and 24 – 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stauf et al. (US 6,277,436 B1) in view of Senzaki et al. (US 6,238,734 B1).

Stauf teaches a process where a barium strontium titanate comprising dielectric layer is produced on a substrate. The process is performed by an MOCVD process that utilizes $Ba(thd)_2$, $Sr(thd)_2$, $Ti(O\text{-}I\text{-}Pr)(thd)_2$ and an oxidizing co-reactant as the precursors (column 6, lines 55-65; column 8, lines 23-25; column 9, line 65, to column 10, line 10). The substrate is held at 400 –1200 degrees Celsius by the use of a susceptor (column 8, lines 25-30). The precursors are provided as a combined feed (column 7, lines 40-45) and are mixed with an oxidizing gas in the chemical vapor deposition reactor (column 4, lines 20-29). As the precursors are mixed with the oxidizer and the method is a CVD processes, as opposed to an ALD process or sequential CVD process, it is implied to one of ordinary skill in the art that at least at some point during the process, the oxidizer and precursors are being fed at the same time, which reads on "simultaneously". Evidence that a CVD process implies

simultaneous feeds is provided below in additionally cited references. Also, table 1 defines growth conditions as having three precursor feeds and an oxidizer feed. Thus, it would have been obvious to supply the feeds at the same time in order to achieve these growth conditions. Stauf discloses that the oxidizing co-reactant can be "any suitable type providing an oxygen containing environment in which the high dielectric metal oxide film is formed on the substrate" (column 8, lines 23-26), but does not explicitly disclose applicant's claimed oxidizing species.

Senzaki teaches suitable oxygen sources for mixture with metalorganic precurors for performing chemical vapor deposition of mixed metal oxide films are oxygen, ozone, nitrous oxide, nitric oxide, nitrogen dioxide, water, hydrogen peroxide, air, and mixtures thereof (column 3, lines 40-43 and 57). lit would have been obvious at the time the invention was made to a person having ordinary skill in the art to use the oxygen sources of Senzaki as the oxiding co-reactants of Stauf as all of the oxygen sources contain oxygen and hence would meet the requirement of Stauf for the oxidizing co-reactant of "providing an oxygen-containing environment".

Claims 5 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stauf et al. (US 6,277,436) in view of Senzaki et al. (US 6,238,734 B1), as applied to claims 1 and 6 above, and further in view of Kang (US 6,127,218).

Stauf in view of Senzaki teaches the methods of claims 1 and 6 as shown above and further teaches that the mixed metal oxide films are for use in the semiconductor industry, but fails to teach that the layer is not homogenous. However, Kang teaches a

process where by adjusting the oxidant stream, it is possible to adjust the composition of the BST film. By having multiple layers of differing composition, the dielectric constants are increased and the leakage currents are decreased (column 2, lines 45-50). These trends are desirable for ferroelectric films, which are used in the semiconductor industry. Therefore, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to adjust the oxidant stream such that layers of differing composition are produced, as taught by Kang, in the method of Stauf in view of Senzaki. By doing so, one would reap the benefits of increasing the dielectric constant of the film and reducing the leakage current, making for a better ferroelectric film.

Claims 1-4, 6-9, 11-22, and 24-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stauf et al. (US 6,277,436 B1) in view of DiMeo, Jr. et al. (US 5,972,430).

Stauf teaches a process where a barium strontium titanate comprising dielectric layer is produced on a substrate. The process is performed by an MOCVD process that utilizes $Ba(thd)_2$, $Sr(thd)_2$, $Ti(O\text{-}I\text{-}Pr)(thd)_2$ and an oxidizing co-reactant as the precursors (column 6, lines 55-65; column 8, lines 23-25; column 9, line 65, to column 10, line 10). As shown above, the precursors and oxidizer are fed simultaneously. The substrate is held at 400 –1200 degrees Celsius by the use of a susceptor (column 8, lines 25-30). Stauf discloses that the oxidizing co-reactant can be "any suitable type providing an oxygen containing environment in which the high dielectric metal oxide film

is formed on the substrate" (column 8, lines 23-26), but does not explicitly disclose applicant's claimed oxiding species.

However, Dimeo, Jr. et al. teaches that suitable oxidizers for depositing BST films onto substrates are oxygen, ozone, nitrous oxide, nitric oxide, nitrogen dioxide, water vapor, hydrogen peroxide vapor, and mixtures thereof (column 9, lines 1-4). Therefore it would have been obvious at the time the invention was made to a person having ordinary skill in the art to utilize such oxidation mixtures in the process taught by Stauf with a reasonable expectation of success. It is noted that DiMeo, Jr. discloses a "digital" process wherein the BST precursors are first deposited and then oxidized (an ALD process). Regardless, the oxidizing agents of DiMeo, Jr. would all clearly meet the requirement of Stauf for the oxidizing co-reactant of "providing an oxygen-containing environment in which the high dielectric film is formed", as all of these species are oxidizers that contain oxygen atoms.

Claims 5 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stauf et al. (US 6,277,436) in view of DiMeo, Jr. et al. (US 5,972,430), as applied to claims 1 and 6 above, and further in view of Kang (US 6,127,218).

Stauf in view of DiMeo, Jr. teaches the methods of claims 1 and 6 as shown above and further teaches that the mixed metal oxide films are for use in the semiconductor industry, but fails to teach that the layer is not homogenous. However, Kang teaches a process where by adjusting the oxidant stream, it is possible to adjust the composition of the BST film. By having multiple layers of differing composition, the

dielectric constants are increased and the leakage currents are decreased (column 2, lines 45-50). These trends are desirable for ferroelectric films, which are used in the semiconductor industry. Therefore, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to adjust the oxidant stream such that layers of differing composition are produced, as taught by Kang, in the method of Stauf in view of DiMeo, Jr. By doing so, one would reap the benefits of increasing the dielectric constant of the film and reducing the leakage current, making for a better ferroelectric film.

Response to Arguments

Applicant argues that the prior art fails to teach that the reactants are fed simultaneously. This is found unpersuasive. Stauf, the primary reference, explicitly teaches that the precursors may be provided as a single multicomponent precursor medium (column 7, lines 43-50). This reads on that the precursors are fed simultaneously. The precursor vapor mixture is then mixed in the CVD reactor with an oxidizing gas (column 8, lines 20-25). As noted above, this implies to one of ordinary skill in the art that at least at some point during the process, the oxidizer and mixed precursors are being fed together, which reads on "simultaneously". To perform the process sequentially would not result in the "oxygen-containing environment" taught by Stauf. To perform the method sequentially would not result in the growth conditions taught in table 1. Therefore, it is implied by the reference, or at the very least obvious from the reference, that the oxidizer and mixed precursor streams are simultaneously

provided. The following references are cited as providing examples that a CVD method involving mixing precursors with oxidizers implies to one of ordinary skill in the art that the streams are fed concurrently at some point during the process: Holst et al. (US 6,500,487 B1 –column 3, lines 30-40), Kimura et al. (US 6,025,222 –column 7, lines 57-67), Kimura (US 5,183,510 –column 7, lines 1-25), Eguchi et al. (US 5,164,363 –column 2, lines 33-56), Fujii et al. (US 5,006,363 –column 4, lines 35-50), and Yamazaki et al. (US 4,105,810 –column 2, lines 4-19).

Even without the above-mentioned implication, there are only two options for feeding the reactants, either sequentially so that at no time the flows are on at the same time (as in an ALD process) or in a manner that reads on "sequentially". To use either option would have been obvious absence evidence of criticality.

Applicant argues, with respect to claim 18, that Senzaki teaches away from the utilization of a diketonate ligand and therefore cannot by combined as a basis of obviousness rejection. This is found unpersuasive. Senzaki is only used as a secondary reference to teach other oxidizers that are known to create oxygen-containing atmospheres that would be obvious to use in the process taught by Stauf. Stauf teaches the use of the diketonate ligands. Regardless of Senzaki teaching a solventless method that avoids the use of the ligands, the oxidizing agents of Senzaki would clearly meet the requirement of Stauf for the oxidizing co-reactant of "providing an oxygen-containing environment in which the high dielectric film is formed", as all of the species are oxidizers that contain oxygen atoms.

Applicant argues that DiMeo teaches away from simultaneous feeds and therefore cannot by combined as a basis of obviousness rejection. This is found unpersuasive. DiMeo is only used as a secondary reference to teach other oxidizers that would be obvious to use in the process taught by Stauf. As shown above, Stauf implies, or at least makes obvious, the use of simultaneous feeds. Regardless of DiMeo teaching a "digital" method (ALD), the oxidizing agents of DiMeo would clearly meet the requirement of Stauf for the oxidizing co-reactant of "providing an oxygen-containing environment in which the high dielectric film is formed", as all of the species are oxidizers that contain oxygen atoms.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eric B Fuller whose telephone number is (703) 308-6544. The examiner can normally be reached on Mondays through Thursdays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shrive Beck, can be reached at (703) 308-2333. The fax phone numbers for the organization where this application or proceeding is assigned are 703 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

EBF
January 22, 2003

TIMOTHY MEEKS
PRIMARY EXAMINER